

TESTING MARSH RESTORATION TO PROTECT WATER QUALITY IN ALABAMA

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The NERRS Science Collaborative is committed to sharing information about the projects we fund in the most effective way we can. Updates about this project will be communicated through nerrs.noaa.gov, webinars, conferences, and meetings. If you would like to stay in touch with this project, contact our program coordinator Cindy Tufts: cindy.tufts@unh.edu

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What's happening?

A team led by the Weeks Bay National Estuarine Research Reserve (NERR) and the University of Alabama has received \$371,099 to explore the use of marsh restoration to reduce nonpoint source pollution in Alabama's estuaries and coastal waters. The team will assess the ability of restoration designs—at varying stages of plant recovery—to remove nitrogen from different types of stormwater runoff. Ultimately, the team will use the results of this demonstration to work with stakeholders to develop a decision support tool to help guide marsh restoration along the state's more developed estuaries.

Why this project?

Stormwater runoff is a major threat to water quality along the Gulf of Mexico. Rain washes over the landscape, picking up pesticides, fertilizer, sediment, oil, heavy metals, trash, toxic chemicals, and disease-causing microbes. Impervious surfaces like roads, parking lots, and buildings can channel these pollutants—known as nonpoint source (NPS) pollution—into streams, creeks, estuaries, and coastal harbors where they degrade water quality and threaten human health. The intensity of this pollution is influenced by several factors, including the capacity of stormwater treatments systems to handle the volume of runoff from impervious surfaces, soil composition, and rainfall patterns that become increasingly uncertain as the climate shifts.



Understanding the ability of partially vegetated marshes to reduce nitrogen pollution could encourage the use of marsh restoration to reach habitat and water quality goals.

Past research has shown that a fully restored coastal marsh with complete plant cover is able to absorb up to 80 percent of the nitrogen pollution in stormwater runoff. Less is known, however, about the capacity of marshes at different stages of restoration to improve water quality. For local scientists and stakeholders who see marsh restoration as an opportunity to take immediate action in addressing NPS pollution, more information about the effectiveness of partially restored marshes in removing nitrogen pollution, and the cost of these designs, is needed.

This team will address that need by conducting focused research on specific designs with different degrees of plant cover. Combined with a subsequent analysis, this information will inform a decision support tool to help managers devise cost-effective management strategies for reducing runoff through marsh restoration.

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About the funder

The NERRS Science Collaborative puts Reserve-based science to work for coastal communities coping with the impacts of land use change, stormwater, non-point source pollution, and habitat degradation in the context of a changing climate. Our threefold approach to connecting science to decision making includes:

- **Funding:** We award an average of \$4 million annually to projects that incorporate collaboration and applied science to address a coastal management problem.
- **Transfer of knowledge:** We are committed to sharing the knowledge generated by the local, place-based research we fund. If you're interested in following this project, contact cindy.tufts@unh.edu
- **Graduate education:** We support TIDES, a Master's of Science program at UNH that provides the skills needed to effectively link science to coastal decision making.

The program operates by a cooperative agreement between the University of New Hampshire (UNH) and the National Oceanic and Atmospheric Administration.

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Fully restored marshes can remove up to 80 percent of the nitrogen in stormwater that filters through the wetland. This team will look at the capacity of marshes with different degrees of plant cover to treat nitrogen under a range of conditions.

How will this project work?

This project will be advised by a Management Applications Team (MAT), composed of representatives from state and federal agencies, city and county offices, nongovernmental organizations, and private industry, who will help keep the project focused on generating information relevant to their needs. For example, the research will address a current concern that, among their other habitat and shoreline protection benefits, restored coastal marshes play a vital role in removing excessive amounts of nutrient pollution. The MAT and NERR staff will use collaborative techniques, including mediated modeling, to maintain a mutually respectful learning environment for the team and the intended users of their research, develop strategies for adaptive management throughout the project, and find the most effective approach for developing and disseminating the resulting management decision support tool.

The applied science component of the project will focus on answering management questions about the capacity for marshes to absorb pollution and explore how restored marshes will respond to different natural and anthropogenic stressors. Investigators will construct test plots at the Weeks Bay NERR to analyze and compare pollution absorption capacity of coastal marshes with 25,

50, and 75 percent plant cover. They also will assess these restored marshes under different conditions—including rainfall events, ranging from a single large storm to prolonged drizzles—and examine how sea level rise impacts the vertical migration of the marshes.

Investigators will use the results of these studies to inform an analysis that contrasts the extent of pollutant removal to the costs of marsh construction and upkeep under current and predicted tidal flooding condition. This analysis will generate a cost-effectiveness ratio and show how that ratio changes at different densities of plant cover. The team will work with the MAT to translate this analysis into a decision support tool that they will share with the broader coastal management community through meetings and trainings.



Partially restored marsh at the Weeks Bay NERR.